



## STATEMENT OF BASIS

Page 1 of 5

BAQ Engineering Services Division

<b>Company Name:</b>	Union Renewable Energy Facility	<b>Permit Writer:</b>	Michael Robertson
<b>Permit Number:</b>	2180-0044	<b>Date:</b>	DRAFT

**DATE APPLICATION RECEIVED:** Initial TV application received September 18, 2015 and one addendum was received May 11, 2016.

### FACILITY DESCRIPTION

Lockhart BioEnergy, LLC (Lockhart) operates a landfill gas energy (LFGE) facility called Union Renewable Energy Facility. Landfill gas (LFG) will be supplied by Union County Regional MSW, owned and operated by Republic Services of Kentucky, LLC (Republic). Lockhart leases a small parcel of land within the landfill property from Republic to operate two (2) Caterpillar engines that remain within the boundaries of the leased space, to generate electricity for sale on the grid.

### PROJECT DESCRIPTION

The facility is applying for an initial Title V permit to incorporate construction permit CA for two (2) Caterpillar G3520C internal combustion engine generator sets for a new Renewable Energy Facility in Union County.

Lockhart consists of two (2) Caterpillar G3520C internal combustion engine generator sets, each rated at 2,242 brake horse power at 100% load; a nominal electrical generator rating of 1.6 MW that will combust landfill gas producing renewable electricity for sale. Each engine set will combust approximately 600 scfm of landfill gas and a heat input rate of approximately 18.2 million British thermal units (MMBtu). No other fuel will be burned in these engines. Fuel not used by LFG engines will be sent to an existing permitted flare located at the Landfill.

The facility consists of the following major components:

1. An LFG compression, dewatering, and filtration system. This system will filter the LFG to 1 micron, dewater the LFG through the use of a chilling system, and compress the LFG for use as a fuel in the engine/generator sets.
2. Two (2) 20-cylinder, spark-ignited 2,242 brake horsepower, reciprocating engine/generators, Caterpillar model G3520C.
3. A closed loop radiator to provide engine cooling.
4. A silencer on the engine.
5. Associated electrical equipment including switchgear, motor control center, transformer, and a main breaker.
6. Each engine/generator will be housed in an enclosed structure.

### COLLOCATION DETERMINATION

In 2014 BAQ Permitting, made a determination for Lockhart BioEnergy (TV-2180-0044) and Union County Landfill (TV-2180-0031) based upon the information which was provided in the Lockhart BioEnergy construction application dated May 2014. The Department determined that the facilities are not collocated. This determination is consistent with other landfill gas to energy projects which permitting have done.

**CHANGES SINCE LAST OP ISSUANCE** This is an initial TV permit.

### SOURCE TEST REQUIREMENTS

The engines are required to be source tested every 8,760 hours or 3 years, whichever comes first, thereafter to demonstrate compliance with the CO, NOx and VOC emission limits imposed for non-certified engines. Source testing

**STATEMENT OF BASIS****Page 2 of 5**

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requirements are defined in 40 CFR 60.4244 Subpart JJJJ.

The facility is updating their PTE for CO (Carbon Monoxide) emissions. The first required test results for pollutant NO<sub>x</sub>, CO, and VOC displayed values (ppmvd) below their respected values for compliance for NSPS JJJJ. The test results were also used to verify compliance with the standard 5.2 NO<sub>x</sub> limit and the requested BACT limit of 2.75 g/HP-hr for CO. A consistent unit of measurement for these limits was not determined from the testing. The facility provided a ratio comparison of the test results to the NSPS limit for CO (Subpart JJJJ Table 1). The comparison resulted in 2.516 g/bhp-hr for engine one and 2.688 g/bhp-hr for engine two.

To avoid carrying a BACT limit of 2.75 g/HP-hr for CO in their initial TV permit, the facility adjusted their PTE for CO based on the engine manufacturer's not to exceed factor of 4.22 g/HP-hr.

Example Calculation CO PTE emissions:

Engine Horsepower (100% load)	2,242 bhp	Manufacturer spec sheet
CO Emission	4.22 g/bhp-hr	Manufacturer not to exceed Value at 100% load

PTE Emissions:	PTE Per Engine	PTE Total for Both Engines
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$$\begin{aligned}(4.22 \text{ g/bhp-hr}) * (2,242 \text{ bhp}) / (453.6 \text{ g/lb}) &= 20.86 \text{ lb/hr} & 41.72 \text{ lb/hr} \\ (20.86 \text{ lb/hr}) * (8,760 \text{ hr/yr}) / (2,000 \text{ lb/Ton}) &= 91.36 \text{ Tons/yr} & 182.72 \text{ Tons/yr}\end{aligned}$$

Example Calculation Formaldehyde PTE emissions:

Engine Horsepower (100% load)	2,242 bhp	Manufacturer spec sheet
Formaldehyde Emission Guarantee	0.42 g/bhp-hr	Manufacturer spec sheet

PTE Emissions:	PTE Per Engine	PTE Total for Both Engines
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$$\begin{aligned}(0.42 \text{ g/bhp-hr}) * (2,242 \text{ bhp}) / (3,600 \text{ sec/hr}) &= 0.26 \text{ g/sec} & 0.52 \text{ g/sec} \\ (0.26 \text{ g/s}) * (3,600 \text{ sec/hr}) / (453.59 \text{ g/lb}) &= 2.08 \text{ lb/hr} & 4.15 \text{ lb/hr} \\ (2.08 \text{ lb/hr}) * (8,760 \text{ hr/yr}) / (2,000 \text{ lb/Ton}) &= 9.09 \text{ Tons/yr} & 18.19 \text{ Tons/yr}\end{aligned}$$

Example Calculation NO<sub>x</sub> PTE emissions:

Engine Horsepower (100% load)	2,242 bhp	Manufacturer spec sheet
NO <sub>x</sub> Emissions	1.25 g/bhp-hr	Standard 5.2 limit

PTE Emissions:	PTE Per Engine	PTE Total for Both Engines
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$$\begin{aligned}(1.25 \text{ g/bhp-hr}) * (2,242 \text{ bhp}) / (3,600 \text{ sec/hr}) &= 0.778 \text{ g/sec} & 1.57 \text{ g/sec} \\ (0.778 \text{ g/s}) * (3,600 \text{ sec/hr}) / (453.59 \text{ g/lb}) &= 6.18 \text{ lb/hr} & 12.36 \text{ lb/hr} \\ (6.18 \text{ lb/hr}) * (8,760 \text{ hr/yr}) / (2,000 \text{ lb/Ton}) &= 27.06 \text{ Tons/yr} & 54.12 \text{ Tons/yr}\end{aligned}$$



## STATEMENT OF BASIS

Page 3 of 5

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### Example Calculation SO<sub>2</sub> PTE emissions:

Assumed Hydrogen sulfide Concentration 100 ppmv  
 Hydrogen sulfide Molecular Weight 34.08 lb/lbmol  
 Sulfur dioxide Molecular weight 64.07 lb/lbmol  
 LFG Flow 600 scfm Maximum anticipated  
 $SO_2 = 2 \times 100 \text{ ppm} \times 34.08 \text{ lb/lb } H_2S \times (64.07 \text{ lb/lbmol } SO_2 / 34.08 \text{ lb/lbmol } H_2S) / 385.3 \text{ scf/lbmol} \times 600 \text{ scfm} \times 60 \text{ mins/hr}$   
 $SO_2 = 1.20 \text{ lb/hr or } 5.24 \text{ ton/yr total for both engines}$

**SPECIAL CONDITIONS, MONITORING, LIMITS** N/A

### EMISSIONS

FACILITY WIDE EMISSIONS		
Pollutant	Uncontrolled Emissions	Controlled/Limited Emissions
	TPY	TPY
PM/PM <sub>10</sub> /PM <sub>2.5</sub>	6.24	No Control
SO <sub>2</sub>	5.24	No Control
NO <sub>x</sub>	54.12	No Control
CO	182.72	No Control
VOC	24.25	No Control
CO <sub>2</sub>	36,608	No Control
CO <sub>2e</sub>	36,702	No Control
Highest single HAP (CAS # 50000)	18.19	No Control
Total HAPs	20.22	No Control

Emissions above are totals for both engines. There are no insignificant activities at the facility.

**OPERATING PERMIT STATUS:** Union Renewable Energy facility is a major source for CO (Carbon Monoxide) and single HAP (Formaldehyde) as the PTE for Carbon Monoxide exceeds the 100 tpy threshold and Formaldehyde exceeds 10 tpy for a single HAP. The facility is required to carry a Title V operating permit.

### REGULATORY APPLICABILITY REVIEW

Regulation	Comments/Periodic Monitoring Requirements
Section II.E - Synthetic Minor	The Project's PTE for any pollutant is less than major source threshold for triggering PSD.
Standard No. 1	The engines do not meet the definition of fuel burning operations as noted in SC Regulation 61-62.1 Section I (30).
Standard No. 3 (state only)	Landfill gas combustion is considered a renewable energy source and was granted an exemption from this Standard based on Section I(J)(2).
Standard No. 4	This project has a 20% opacity limit and no particulate matter process emissions. Landfill gas is the sole source of fuel for the engines and therefore is exempt based on process weight rate definition "The Process Weight Rate definition excludes liquids and gases that are used solely as fuels".



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Page 4 of 5

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Regulation	Comments/Periodic Monitoring Requirements
Standard No. 5	This process is not subject to this standard because the facility is being constructed after 1980.
Standard No. 5.2	This facility is subject to this standard for Internal Combustion Engines fired on Landfill Gas. - Section III (Table 1). The NOx emissions are based on the 1.25 gm/bhp-hr limit imposed by standard 5.2. The emission limit was verified by the NSPS JJJJ (initial source testing conducted on May 19, 2015).
Standard No. 7	The facility's PTE for any pollutant is less than 250 TPY; therefore, the facility is not major for PSD.
61-62.6	Operation of the engines will not result in fugitive particulate matter; therefore, this regulation will not apply.
40 CFR 60 and 61-62.60	<p>40 CFR 60 Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines. Applies to engines, combusting landfill gas, with a maximum engine power greater than or equal to 500 HP for which the owner commenced construction after June 12, 2006 and the manufacture date of the engine after July 1, 2007 or later. The IC engines are subject to this rule since the construction date is after 2011 and the engines are rated at 2,242 HP (each). Owners and operators of stationary SI ICE (spark ignition IC engines) &gt;100 HP must comply with the emission standards in Table 1 of this subpart.</p> <p>40 CFR 60, Subpart CCCC and DDDD: Non-Hazardous solid waste determination: When landfill gas (LFG) is conveyed in a pipe to a combustion unit, it is not considered to be a "contained gaseous material", meeting the definition of "solid waste" as per 40 CFR 258.2. Since the LFG doesn't meet the definition of being a "solid waste" it is not subject to CISWI.</p>
40 CFR 61 and 61-62.61	This facility is not subject to any Part 61 requirements
40 CFR 63 and 61-62.63	<p>40 CFR 63 Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines: Establishes emission and operating limitations for HAP from RICE located at major and area sources of HAP emissions. The Union Renewable Energy Facility is a major source for HAP. A new or reconstructed stationary RICE with a site rating of more than 500 brake HP located at a major source of HAP emissions, combusting landfill gas equivalent to 10 percent or more of the gross heat input on an annual basis must meet the initial notification requirements of 40 CFR 63.6645(f) and the reporting and record keeping requirements of 40 CFR 63.6625(c), 63.6650(g), and 63.6655(c). The IC engines do not have to meet the emission limits and operating limitations of this subpart. The proposed IC engines, located at a major source of HAP, are new since construction commenced after December 19, 2002.</p> <p>Since the LFG-fired engine/generator sets are new and located at a facility that is a major source of hazardous air pollutants, the requirement under the Reciprocating Internal Combustion (IC) Engine NESHAP, 40 CFR 63 Subpart ZZZZ, includes meeting the applicable requirements of 40 CFR 60 Subpart JJJJ.</p>

**STATEMENT OF BASIS****Page 5 of 5**

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<b>Regulation</b>	<b>Comments/Periodic Monitoring Requirements</b>
61-62.68	The facility does not store chemicals subject to 112(r) above the threshold quantities.
40 CFR 64	The internal combustion engine generators exceed Title V thresholds for CO and single HAP; however, since there are no add on controls this regulation will not apply.

**AMBIENT AIR STANDARDS REVIEW**

<b>Regulation</b>	<b>Comments/Periodic Monitoring Requirements</b>
Standard No. 2	This facility has demonstrated compliance through Dispersion Modeling; see modeling summary dated 10.13.2016
Standard No. 7.c	There are no baselines established for PM <sub>10</sub> , SO <sub>2</sub> , or NO <sub>x</sub> for Union County; therefore, Standard 7 modeling is not required.
Standard No. 8 (state only)	This facility has demonstrated compliance through Dispersion Modeling; see modeling summary dated 10.13.2016

**PUBLIC NOTICE**

This Title V Permit will undergo a 30-day public notice period and a 45-day EPA comment period in accordance with SC Regulation 61-62.1, Section II.N. This permit was placed in *The Union Daily Times* on December 28, 2016. The comment period was open from December 28, 2016 to January 26, 2017 and was placed on the BAQ website during that time period.

**ADDITIONAL PUBLIC PARTICIPATION****SUMMARY AND CONCLUSIONS**

It has been determined that this source, if operated in accordance with the submitted application, will meet all applicable requirements and emission standards.